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MR. HIGGS' MONOCHORD.

THE monochord is an oblong, rectangular box, made of mahogany, 26 inches long, $2\frac{1}{4}$ inches wide, and $2\frac{1}{8}$ inches high. On the upper surface are marked the diatonic and chromatic scales; a single wire is extended lengthwise over a bridge at either end of the instrument, and the different notes are produced by moving a third bridge along the top of the instrument with the right hand, while the wire is touched with one finger of the left hand. Unlike the tuning-fork, which is capable of producing only one tone or note, the monochord produces any of the notes either of the diatonic or any other scale. It also gives a correct idea of vibration and the theory of sound.

AN ACCOUNT OF MESSRS. CARMICHAEL, FAIRBANKS,
AND CO.'S AMERICAN EXCAVATING MACHINE.

BY W. NEWTON, JUN. ESQ.

THE machine is composed of the following parts, viz. first, a strong wooden platform placed upon wheels, in order to be moved along a temporary railway previously constructed for that purpose. Second, a strong crane placed at one end of the platform, to which it is firmly connected at its base. This crane is so constructed that it may be turned round beyond a right angle either to the right or left of the platform. Third, an instrument, which may be termed a shovel, bucket, scraper, excavator, or digging tool, for removing and collecting the earth; this shovel or excavator, being suspended from the jib of the crane, is raised or lowered at pleasure, by means of chains which are in connexion with the steam-engine by which the machinery is actuated. Fourth, an arrangement of wheelwork communicating with the steam-engine, which is fixed on the platform, and put in motion thereby, and by means of which wheelwork or gearing the attendants who work the machine may direct its movements with the greatest precision. The motion of the platform is also effected by the same engine.

The bucket or excavator will hold about $1\frac{1}{2}$ cubic yards of earth, the lower side is rounded and indented with a series of sharp steel points, similar to those of a ploughshare, the sides and upper part being square. This bucket is hung by the middle upon braces fastened to a stout wooden arm of any required length, which is rigged out or drawn in by chains connected with the steam-engine machinery. The depth to which the bucket is thrust is regulated

by a person standing on the crane platform ; this person elevates or depresses the mouth of the bucket according to the nature and position of the soil. The bucket is worked by a chain passing over two purchase wheels, and thence to an iron barrel or windlass which is turned by the steam-engine. When the bucket has been filled and drawn up, the crane is swung round by a chain passing round the drum, and is stopped at the place where it is to be discharged ; a bolt is then drawn from the bottom of the bucket, and its contents run through into the earth wagon ;* this man also governs the movements of the shovel. The machinery being in motion, the man at the crane raises one of his levers, and the shovel descends by its own gravity, while he holds his thrusting lever fast, by which means the bottom of the shovel becomes uppermost, and the lower or long side at an angle of about 45° . As the shovel strikes the earth, at any required point, he gives power to the thrusting motion, and at the same time slight force is applied to the main chain, from which causes the shovel receives power from both chains, and performs a curve in the earth at the pleasure of the attendant, according to circumstances. As the shovel is filled the man raises his thrusting lever, and the shovel, now in a more upright position runs back perpendicular with the chain by its own gravity. The engine-man, by means of a lever, conveys power to the turning round motion, when the crane swings round with the shovel over the earth-wagon, then by the short lever on the thrusting arms, the crane-man withdraws the bolt securing the bottom of the shovel, which is suspended on hinges, and the earth slides into the car intended to receive it ; reverse power is immediately given to the crane, which is brought round again, and the shovel is caused to strike at any desired point for another load, forming in its descent a direct line with its position over the earth-car ; at the same time the bottom swings again to its place, always closing with a catch and spring to secure it.

In removing rocks, when they are too large to be caught on the shovel, chains are passed around the stone and secured to the pulley-block of the main chain, when they are raised and swung round as before.

These machines are particularly advantageous for day and night work, and their operations are not affected by the weather, except when the process of transporting the earth is impeded or

* The boiler in which the steam is generated is of the vertical tubular form, the pressure of steam being 60 pounds on the square inch. The attendance required to keep the machine at work comprises an engine-man, a stoker, a brakesman, and a labourer. The quantity of stiff clay which has been excavated and received in wagons on the Eastern Counties Railway, near Brentwood, in 12 hours, is equal to 1080 cubic yards ; the consumption of coke in the same time is stated to have been 1680 lbs. or 1.55 lbs. per cubic yard of clay excavated.—F. W.

rendered impossible by that cause. The machines are particularly well calculated for canal-digging, as well as redeeming marshy lands, alluvial irrigated soils, and uncovering mining rocks, and, it is believed, chalk-cliff excavations.

MESSRS. YOUNG AND DELCAMBRE'S TYPE-SETTING
MACHINE.

BY THE SECRETARY.

It may be well to give a short explanation of the ordinary mode of setting up type before describing the mechanical contrivance for the same purpose by Messrs. Young and Delcambre.

The various letters and figures to be used in any composition are arranged in trays technically called cases. These cases have small compartments or boxes, differing in size according to the recurrence of the letters; thus e, the letter most used, requires the largest compartment. The boxes next in size are for the letters c, d, i, m, o, r, t, and u, and so on. The type-case stands upon a sloping frame of sufficient elevation for a man of ordinary height to pick out the letters or types from the various boxes. This person is called a compositor, and holds in his left hand what is called a composing-stick. In this composing-stick or metal trough (the length of which is adjustable to serve for lines of every length), he places the letters and the various spaces, quadrats, &c. which separate the words. It must be borne in mind that the same person who composes the type also justifies the page, that is, leaves it in a fit state to go into the printing-press, by adjusting each line to the exact length required for the width of the page on which he is engaged.

When the composing-stick is filled with eight or twelve lines of type, the mass is removed to and placed upon a galley or long tray, and the compositor again sets about refilling his stick. Of course, to make up a sheet it requires a number of pages, the arrangement of which is called imposing. But it is not here required to explain the operations of the printing-office further.

The upper part of Messrs. Young and Delcambre's machine consists of the type-reservoirs or grooves, each of which is $\frac{3}{16}$ ths of an inch in width, and of a depth equal to the length of the type, or nearly one inch.

These reservoirs are placed in a slightly inclined position to prevent the letters from falling out, the longest reservoirs in use